



Armed Forces College of Medicine AFCM





Pathology of bone tumors (2)



INTENDED LEARNING OBJECTIVES (ILO)



By the end of this lecture the student will be able to:

- 1. Analyze the clinico-pathologic features of chondrosarcoma.**
- 2. Analyze the clinico-pathologic features of Ewing's sarcoma.**
- 3. Recognize basic facts related to bone metastasis.**
- 4. List causes of pathological fractures.**
- 5. Define osteodystrophy & list its causes.**
- 6. Discuss pathology of fibrous dysplasia.**
- 7. Mention etiology, and pathogenesis of Paget's**



Lecture Plan



1. Part 1 (5 min) Introduction
2. Part 2 (35 min) Main lecture
3. Part 3 (5 min) Summary
4. Lecture Quiz (5 min)



CHONDROSARCOMA-2



❖ Chondrosarcoma is less common than osteosarcoma

❖ Origin:

It is a malignant neoplasm characterized by **chondrogenic cells** □ secreting cartilagenous matrix.

❖ Predisposing Factors:

- Paget's disease of bone.
- Fibrous dysplasia.
- Chondroma
- Osteochondroma.



CHONDROSARCOMA-2



- ❖ **Age:** The **4th decade** is the most common, but younger and older ages may be affected
- ❖ **Site :** Bones in the **central portions of the skeleton (pelvis, shoulder & ribs)** but any bone could be affected

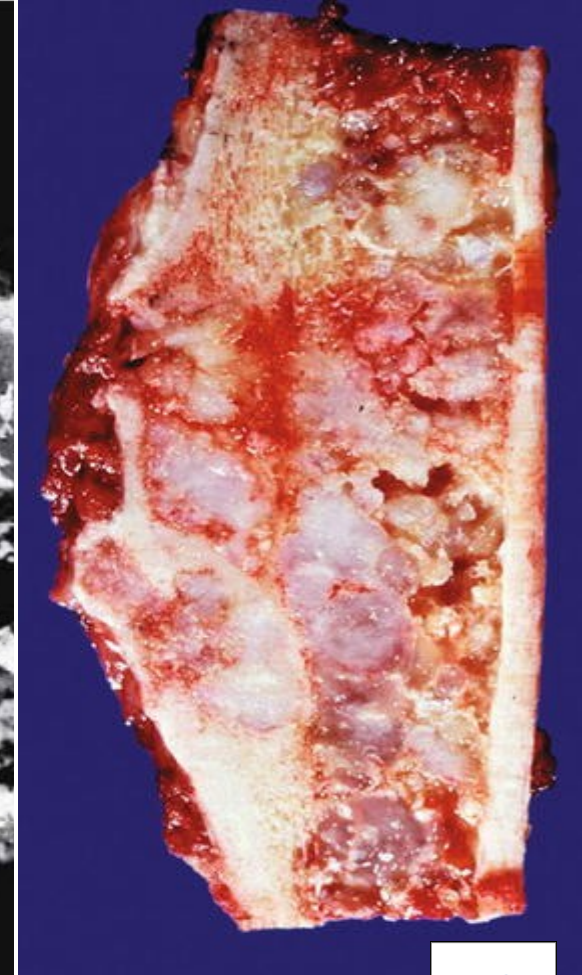
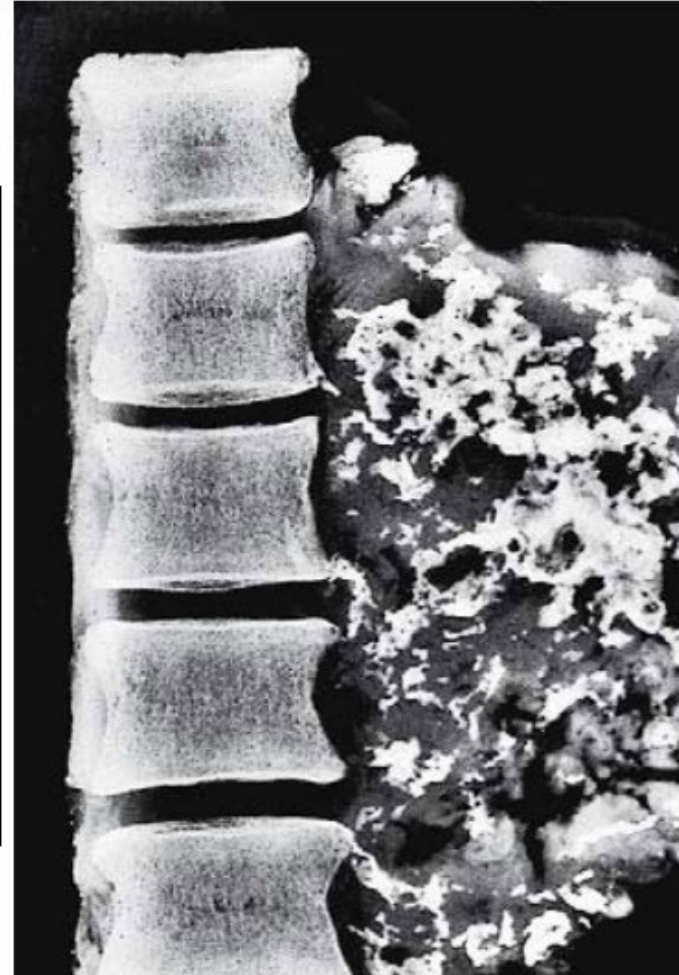


CHONDROSARCOMA-2



Radiological Features:

Popcorn (mottled) densities due to spotty calcifications are commonly detected.



CHONDROSARCOMA-2



- ❖ **Gross:**
- ❖ The tumor grows within the **medullary canal**.
- ❖ **Penetrate the cortex and periosteum** ---> extends into the adjacent soft tissues
- ❖ Areas of **necrosis and hemorrhage**.
- ❖ Has **bluish grey translucent** cut section
- ❖ **Chalky white Calcifications**



CHONDROSARCOMA-2

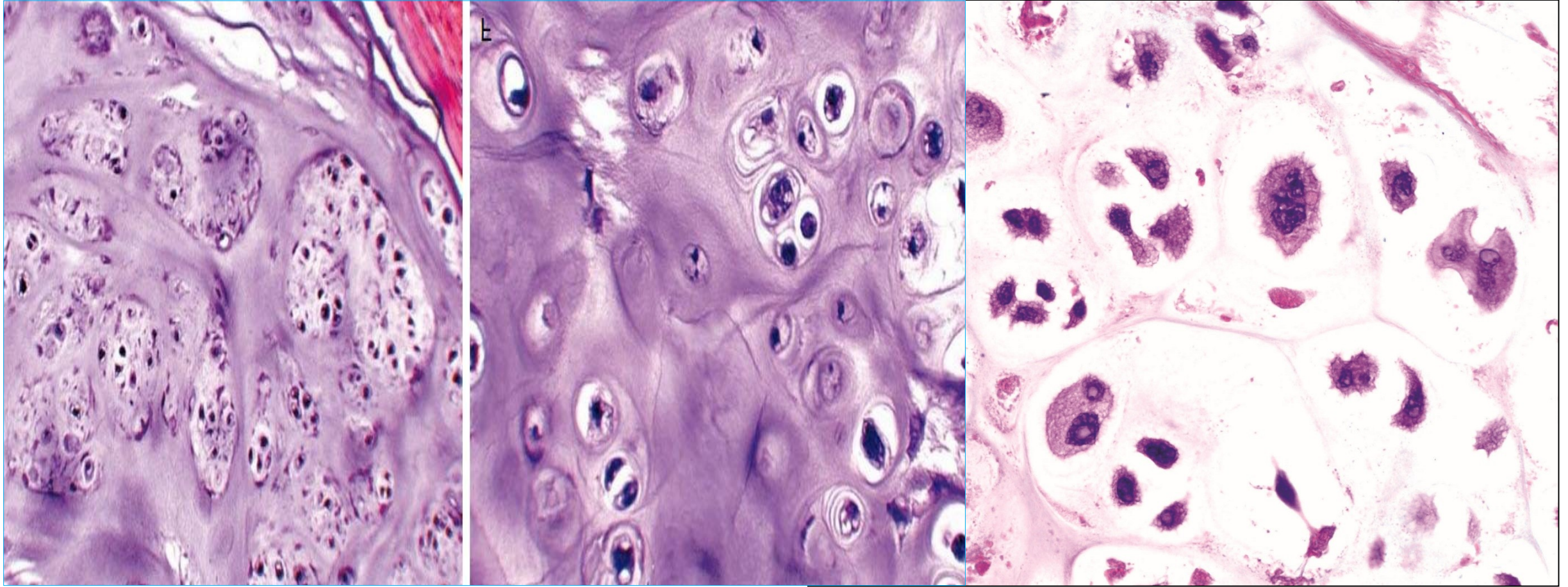


Microscopic Features:

- **Tumor cells:** Pleomorphism, large dark nuclei and frequent mitoses.
- **Hyaline matrix:** according to the degree of differentiation
+++ matrix in low grade tumors.
---- matrix in high grade tumors.



CHONDROSARCOMA-2



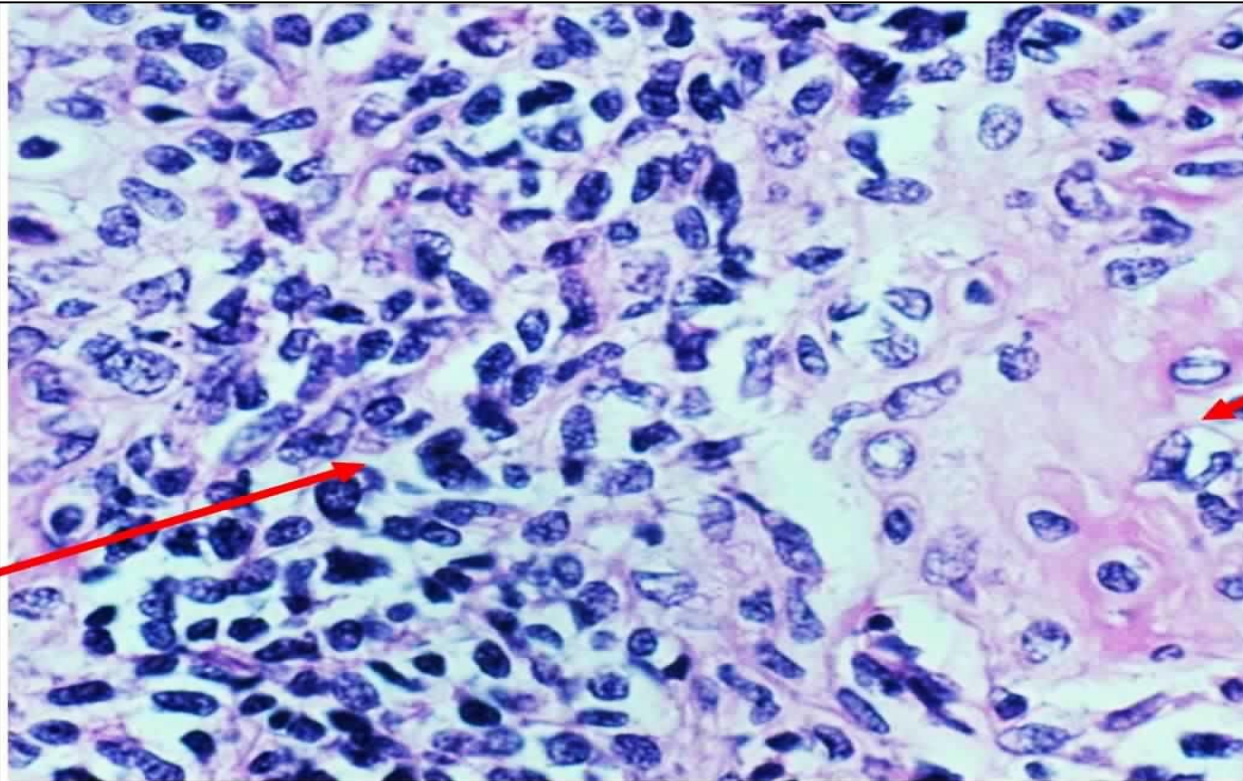
**Malignant chondrocytes in
lacunae**



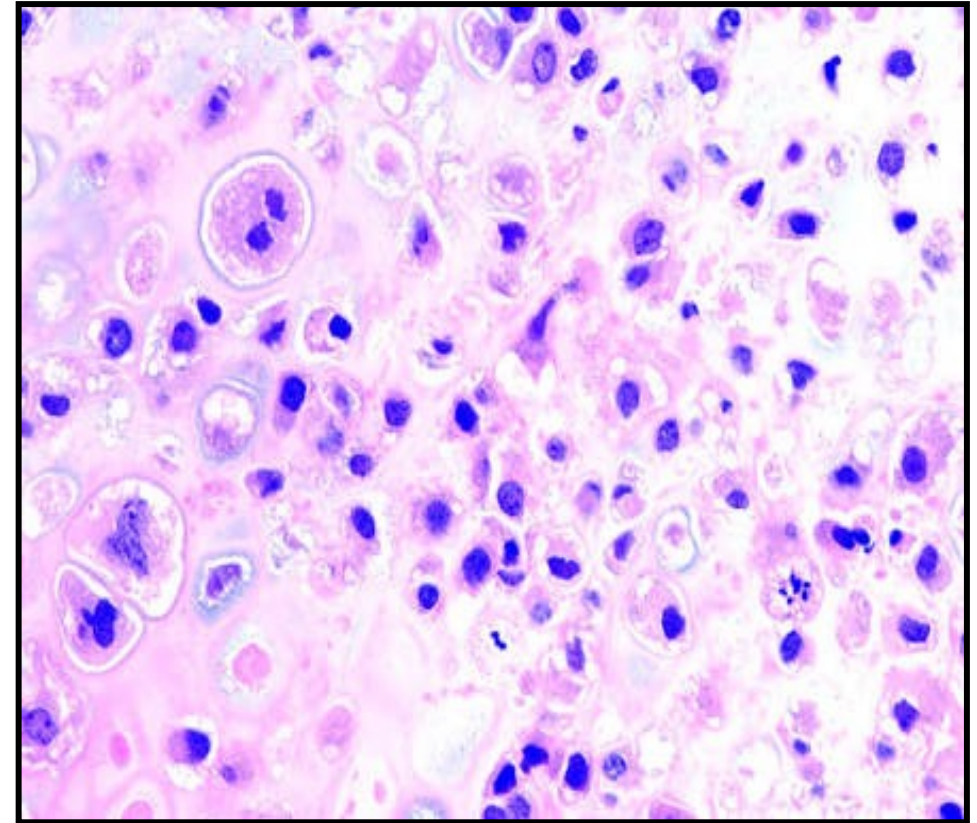
CHONDROSARCOMA-2



Microscopic Features:



<http://www.tumorsurgery.org/tumor-education/bone-tumors/types-of-bone-tumors/mesenchymal-chondrosarcoma.aspx>



<http://www.pathologyoutlines.com/topic/bonechondrosarcoma.html>



CHONDROSARCOMA-2



Spread:

1. **Low grade**
chondrosarcoma spreads **locally** with no distant spread .
2. **High grade**
chondrosarcoma spreads **locally** and by **blood**
(similar to osteosarcoma)

Prognosis: Generally **better**
than osteosarcoma



Ewing's sarcoma-3



- ❖ **Definition:** It is a malignant neoplasm of undifferentiated cells arising within the marrow cavity.
- ❖ **Age:** 5-20 years.
- ❖ **Aetiology:** The classic translocation for Ewing sarcoma is t(11;22), which produces the EWS-FLI1 fusion protein.



EWING'S SARCOMA-3

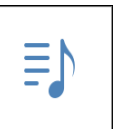


Origin and Sites:

- The origin is unsettled; recently believed to be of neural origin□ from primitive neuroectodermal cells
- In the medullary canal of the diaphysis of long bones especially the femur or in the flat bones of the pelvis.
- It may also arise in soft tissues (& is called primitive neuroectodermal tumor ; **PNET**).



Age: 5-20 years, but may occur in older age groups (PNET).



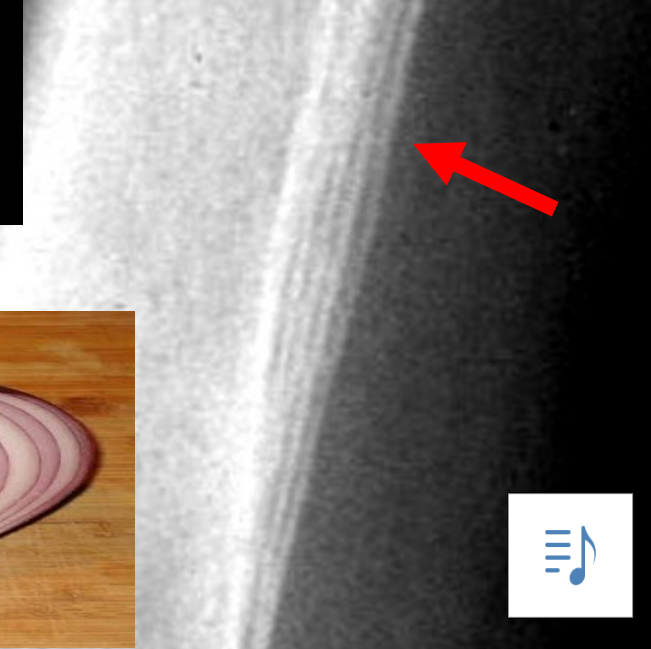
EWING'S SARCOMA-3



➤ **Painful tender swelling** that may be clinically confused with osteomyelitis.

➤ **Radiological Features:**

➤ Osteo**lytic** destructive bone lesion **periosteal reaction** □ layers of reactive bone deposition (**onionskin-like fashion**)



EWING'S SARCOMA-3



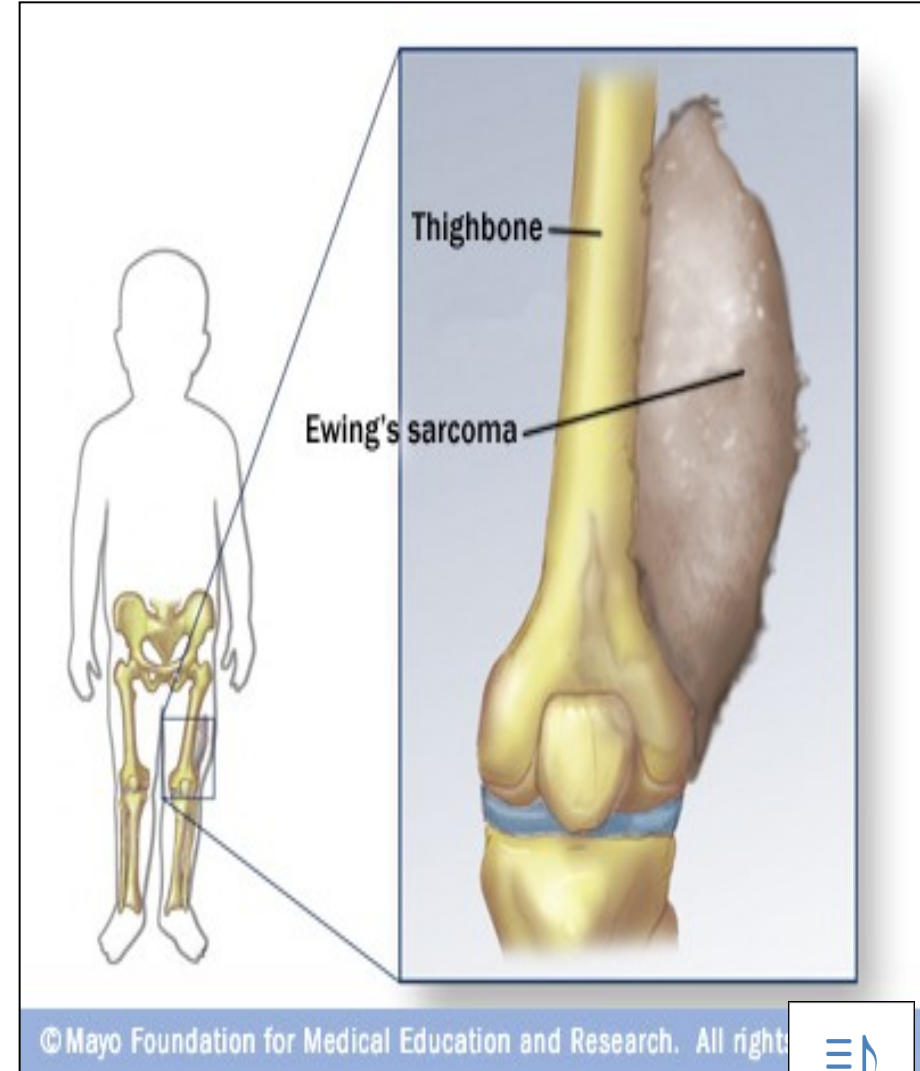
Gross:

A **soft mass** with extensive **necrosis** and **hemorrhage** that destroys the bone cortex.

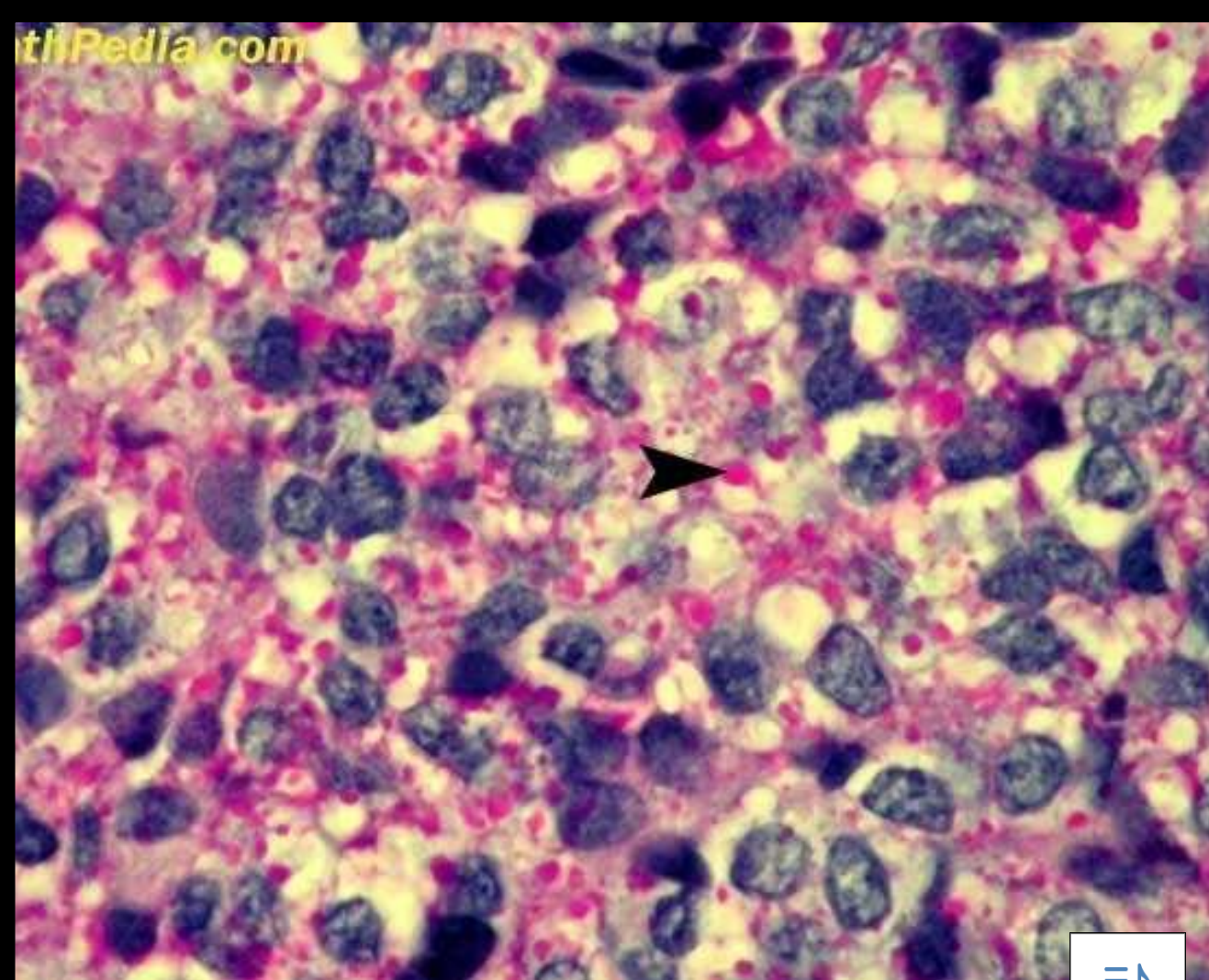
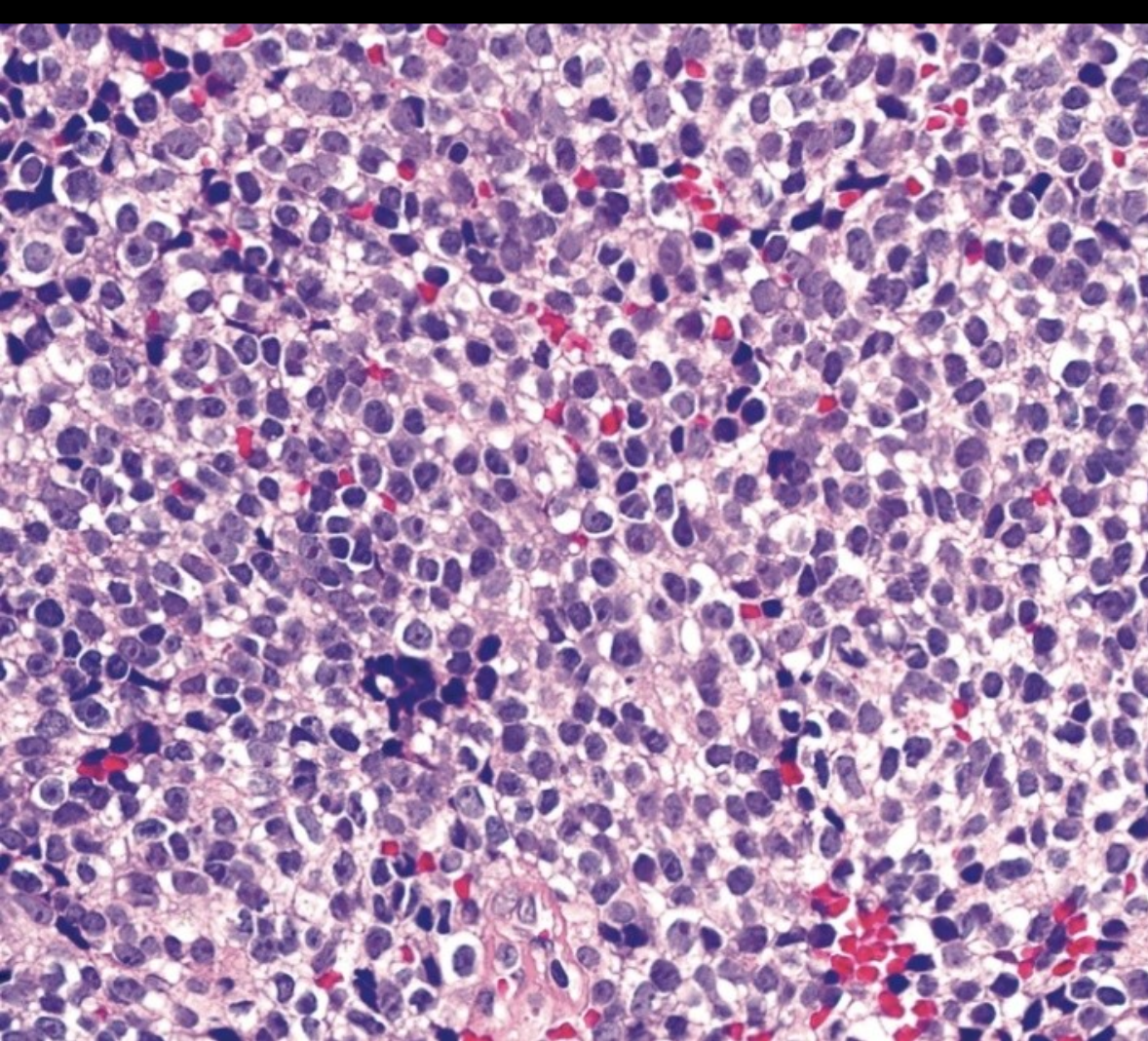
Microscopic:

Round cells with **dark nuclei**, (confusing with lymphoma & neuroblastoma) their cytoplasm characteristically contains **glycogen**

Spread: Direct and by blood



EWING'S SARCOMA-3





- **Metastasis to bone is much more common than primary bone tumor.**
- Bony metastases of carcinomas predominate over the sarcomas.
- Common primary sites: include prostate (often osteoblastic), breast, lung, thyroid and kidney



CAUSES OF PATHOLOGICAL FRACTURE



1. **Inflammatory disease** (acute osteomyelitis, chronic osteomyelitis...).
2. **Osteodystrophies:** Osteoporosis, fibrous dysplasia, Paget's disease, hyperparathyroidism, rickets, osteomalacia
3. **Primary malignant tumors**
4. **Metastases.**
5. **Bone cysts** (as aneurysmal cyst & hydatid cyst).



Osteodystrophies



Definition:

Abnormalities of bone growth & structure

1. FIBROUS DYSPLASIA

2. PAGET'S DISEASE

3. OSTEOPOROSIS

4. OTHERS:

Hyperparathyroidism (osteitis fibrosa cystica)

Rickets & Osteomalacia



FIBROUS DYSPLASIA-1



Affects any bone, at any age

Pathology:

1-Monostotic: Single bone involvement.

2-Polyostotic: Multiple but never all bones.

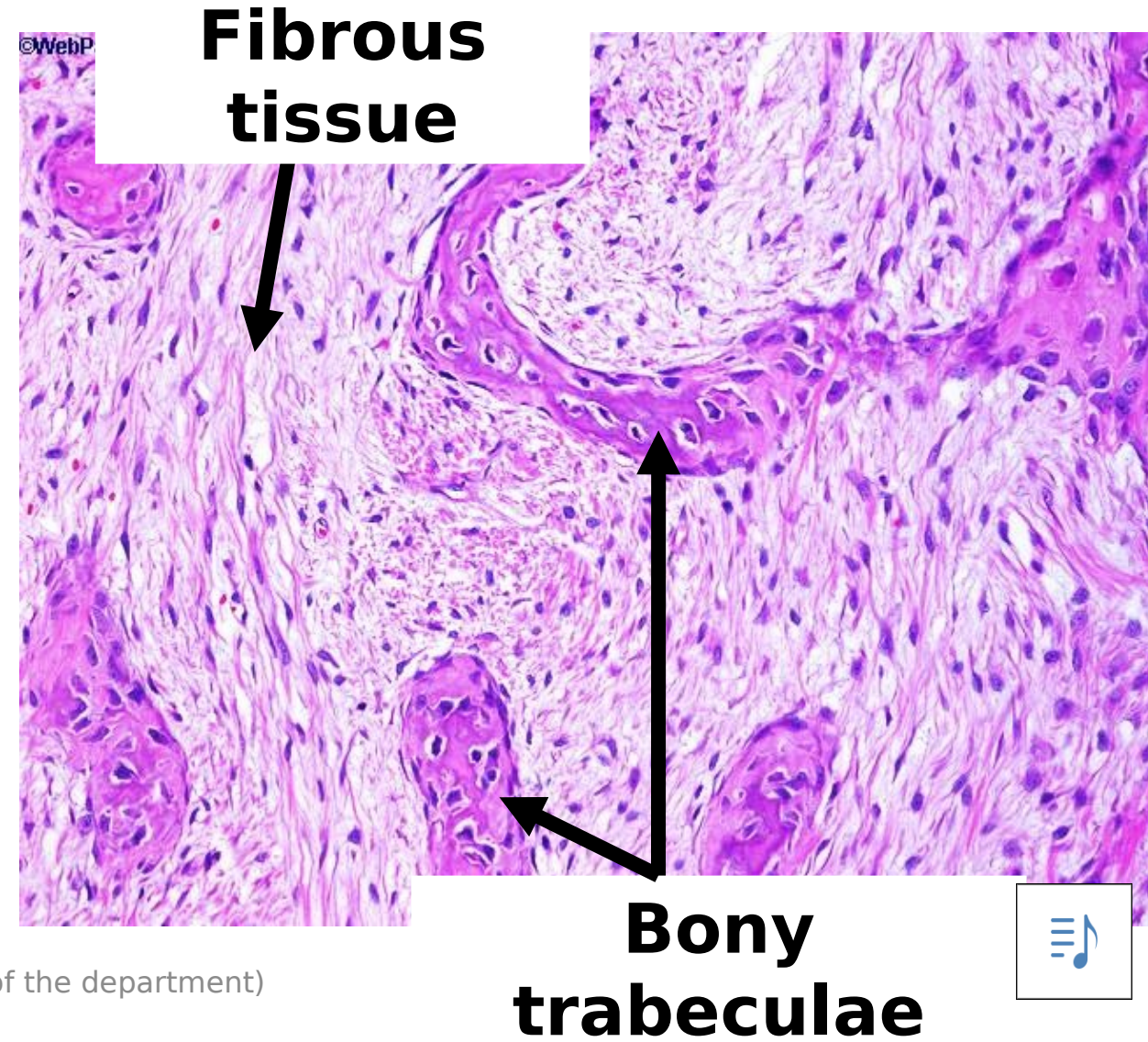
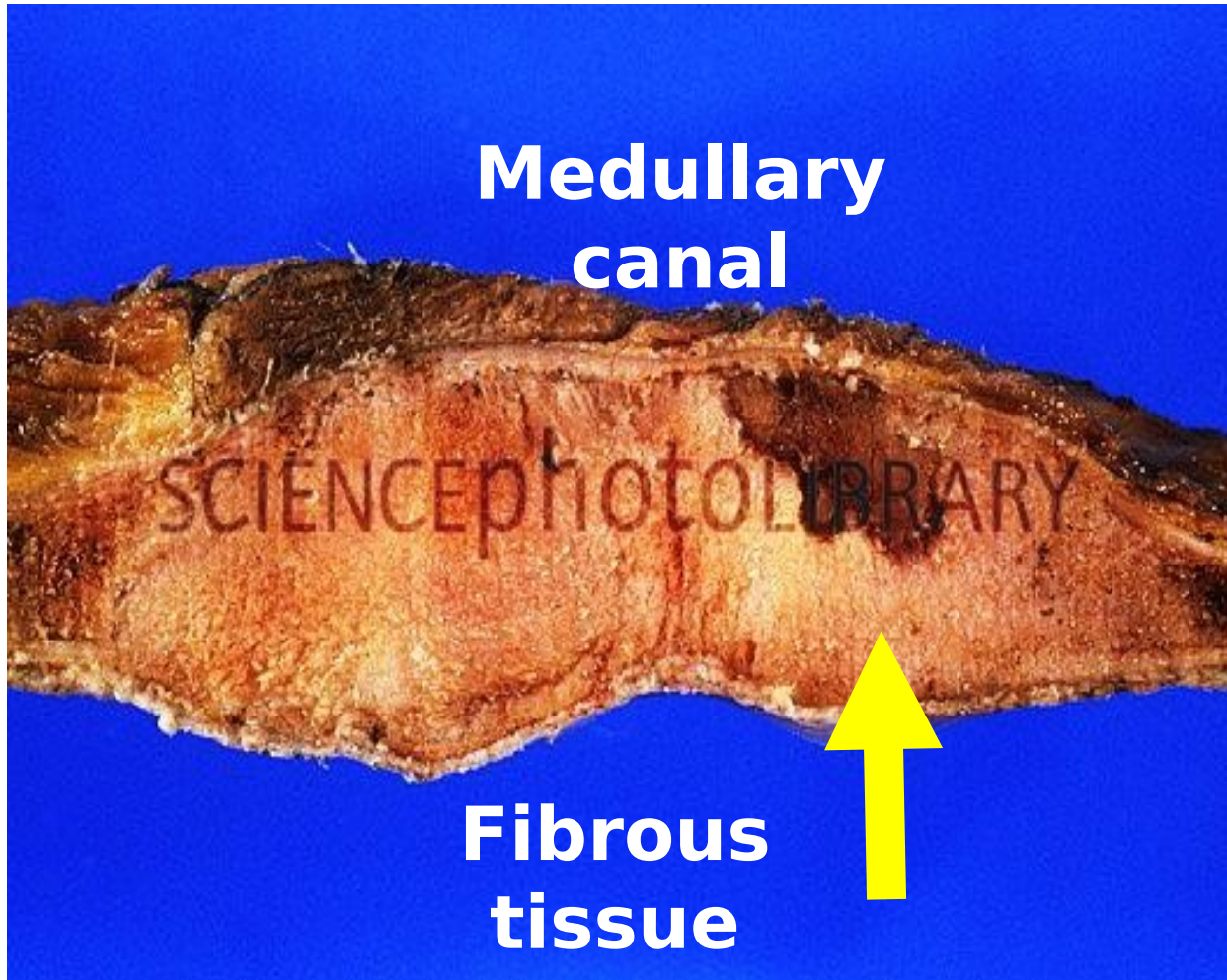
Grossly: **Medullary fibrous proliferation** associated with **cortical thinning**.

Microscopically: there is **fibrous tissue proliferation** trapping **thin irregular bone trabeculae**

Complications: 1)Pathological fracture. 2)Sarcomatous transformation.



FIBROUS DYSPLASIA-1



Paget's disease of bone (osteitis deformans) -2



- Unknown etiology, affecting **old males**. Very rare in Egypt.
- **Bone resorption (decalcification) □ excessive replacement by WEAK bone**
- **Complications:**
 - Pathological fracture
 - Sarcomatous transformation
 - High cardiac output heart failure



Paget's disease of bone (osteitis deformans) -2



Osteolytic phase □ Osteoblastic phase □ Osteosclerotic phase

Bone resorption

Bone formation

Increased bone density



Bone DEFORMITY

Skull enlargement,
narrowing of
foramina

Bending of long
bones





A tumor arises in the upper tibia, grossly appearing as a mushroom shaped mass:

- a. This is a benign tumor.
- b. It arises also in skull bones.
- c. It originates from medullary canal.
- d. Is called exotosis.
- e. Spreads by blood



SUGGESTED TEXTBOOKS



1. Robbins basic pathology, ninth Edition
2. Kaplan step 1 pathology lecture notes 2017 (P.78-98)

